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10/539,892

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EXAMINER

HENN, TIMOTHY J

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2622

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|----------------------------------|--|
| Office Action Summary | Application No. 10/539,892 | Applicant(s) XU ET AL. | |
| | Examiner Timothy J. Henn | Art Unit 2622 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 March 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,10-14 and 17-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,10-14 and 17-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 February 2009 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.
2. The drawings were received on 09 February 2009. These drawings are accepted and overcome the previous objections to the drawings.
3. Applicant's amendments to the specification to rewrite the abstract and add the appropriate section titles are accepted and overcome the previous objections to the specification.
4. The amendments to claims 11 and 13 overcome the previous 35 USC §112, 2nd Paragraph rejections to these claims.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 2, 10-14 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (hereinafter AAPA) in view of Marchi (US 6,512,575).

[claim 1]

Regarding claim 1, AAPA discloses a 3D image sensor comprising a light source emitting a modulated emitted signal into the viewed scene; and a receiving array consisting of a plurality of pixels, the pixels generating a received signal for every pixel individually from a demodulation signal comprising a predetermined phase position with respect to the emitted signal and from the detected radiation reflected by the scene, the received signal being used as a measure of distance (Specification, p. 1, Paragraphs 2-4). However, AAPA does not disclose calibrating the receiving array as claimed.

Marchi discloses a similar system which measures a distance to an object using modulated light (Figure 3). Marchi further discloses a calibration procedure which can be performed at specified intervals to ensure that the same value will be given for all operating conditions (c. 11, l. 13 - c. 12, l. 57). In the calibration procedure of Marchi the receiving portion is exclusively illuminated with a first modulated calibrating radiation having a first phase position of a modulation thereof with respect to the demodulation signal, and the received signal generated by the detector during the illumination is evaluated (c. 13, l. 3 - c. 16, l. 19). Therefore, it would be obvious to calibrate the device of AAPA as taught by Marchi to ensure that accurate measurement of distances will be obtained. While Marchi discloses performing the calibration for a single detector, it is noted that the system of AAPA discloses an array of detectors (Specification, p. 1, Paragraphs 2-4). Therefore, it would be obvious to apply the calibration procedure of Marchi to each pixel in the array of detectors of AAPA to ensure the accurate measurements could be obtained from each detector.

[claim 2]

Regarding claim 2, AAPA in view of Marchi discloses detecting the relative phase deviation between the pixels (e.g. detecting the phase error for each detector; Marchi, c. 15, l. 4 - c. 16, l. 2).

[claim 10]

Regarding claim 10, Marchi discloses a second calibrating measurement carried out with a second modulated calibrating radiation having a second phase position of a modulation thereof between the second calibrating radiation and the demodulating signal, the second phase position differing from the first phase position (c. 13, l. 3 - c. 14, l. 36).

[claim 11]

Regarding claim 11, Marchi discloses that the modulation and therefore the phase position may be freely adjustable (c. 14, ll. 30-36).

[claim 12]

Regarding claim 12, Marchi discloses the use of a target to reflect illumination to a detector, but does not disclose another modulated light source. Official Notice is taken that a reference light source may be provided instead of a target for calibration. Therefore, it would be obvious to use a second modulated light source to provide the modulated illumination for the calibration procedure of Marchi since the use of a specific calibration light source is an art recognized equivalent which would provide direct illumination without the need for the illumination to be reflected by a calibration target.

[claim 13]

Regarding claim 13, Marchi discloses calibration radiation which is generated by the modulated light source, wherein the calibrating radiation is deflected from the modulated light source to the detector and an external light path for illuminating the scene by the modulated light source is interrupted (Figures 1 and 2; c. 11, l. 45 - c. 12, l. 15).

[claim 14]

Regarding claim 14, AAPA in view of Marchi disclose detecting pixel individual phase differences (e.g. phase error), but do not explicitly disclose storing the pixel individual phase differences in a lookup table. Official Notice is taken that it is well known in the art to store calibration results in a memory so that the calibration results are not lost if power is removed from the system. It is further well known to store information in lookup tables so that the information may be easily accessible, and information corresponding to different items can be prevented from being mixed up. Therefore, it would be obvious to store the calibration results (e.g. phase, gain and offset errors) for each detector in a lookup table to ensure the values are not lost or mixed up.

[claim 17]

Regarding claim 17, Marchi discloses a second phase position which differs from the first phase position which is caused by delaying the second radiation relative to the first radiation or by delaying the demodulation signal, and wherein an actual physical transit distance respectively of both the first and second calibration radiations to the

Art Unit: 2622

receiving array remains the same (c. 13, l. 3 - c. 14, l. 36; virtual target distances).

[claim 18]

Regarding claim 18, AAPA in view of Marchi discloses that the distance to the viewed scene for a given one of the pixels is respectively measured based on the transit time which is determined from the received signals that is generated by mixing the demodulation signal with a pixel signal representing the detected radiation so as to determine a phase position of a modulation of the detected radiation relative to a modulation of the modulated emitted signal (AAPA, Specification, p. 1, Paragraphs 2-4).

[claim 19]

Regarding claim 19, AAPA discloses a method of operating a 3D image sensor having a receiving array that includes a plurality of pixels, the method comprising: in an operation mode, generating a modulated illuminating radiation and an operating demodulating signal, both having a modulation with the same modulation frequency, illuminating a 3d scene with the modulated scene illuminating signal, and reflecting the modulated scene illuminating radiant from the 3D scene to the receiving array, receiving the reflected radiation with the pixels of the receiving array and producing respective operation output signals, demodulating the respective operation output signals with the operating demodulating signal to produce respective demodulated operation output signals of the pixels and determining a respective distance to a respective point of the 3D scene respectively for each one of the pixels from the demodulated operation output signals (Specification, p. 1, Paragraphs 2-4). However, AAPA does not disclose a calibration method as claimed.

Marchi discloses a similar system which measures a distance to an object using modulated light (Figure 3). Marchi further discloses a calibration procedure which can be performed at specified intervals to ensure that the same value will be given for all operating conditions (c. 11, l. 13 - c. 12, l. 57). The calibration procedure or "mode" of Marchi generates a first modulated calibration radiation and a calibrating demodulation signal, both having a modulation with the same modulation frequency, illuminating the receiver with the first modulated calibrating radiation having a first phase position of the modulation thereof and demodulating respective calibration output signals of the pixels with the calibrating demodulation signal to produce a demodulated calibration output signal, and determining calibration parameters from the demodulated calibration output signal (c. 13, l. 3 - c. 16, l. 19; e.g. a phase difference with respect to a desired result is determined). Therefore, it would be obvious to calibrate the device of AAPA as taught by Marchi to ensure that accurate measurement of distances will be obtained. While Marchi discloses performing the calibration for a single detector, it is noted that the system of AAPA discloses an array of detectors (Specification, p. 1, Paragraphs 2-4). Therefore, it would be obvious to apply the calibration procedure of Marchi to each pixel in the array of detectors of AAPA to ensure the accurate measurements could be obtained from each detector. Once calibrated, it would be obvious to use the obtained calibration parameters during the operating mode as taught by Marchi (c. 15, ll. 25-61) so that the detected distance is accurate. It is noted that while the demodulation and compensation steps occur simultaneously in the compensation taught by Marchi, the

claim as written does not explicitly define the order in which these two steps must occur.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy J. Henn whose telephone number is (571) 272-7310. The examiner can normally be reached on M-F 11-7.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Ometz can be reached on (571) 272-7593. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2622

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Timothy J Henn/
Primary Examiner, Art Unit 2622